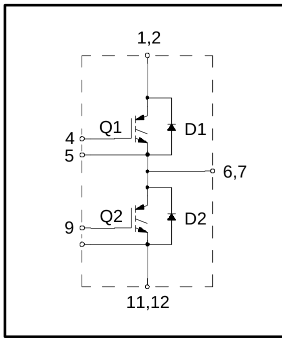
International Rectifier

Preliminary Data Sheet PD - 5.036

CPU165MK

IGBT SIP MODULE

Short Circuit Rated UltraFast IGBT



Features

- Short Circuit Rated - 10µs @ 125°C, V_{GE} = 15V
- Fully isolated printed circuit board mount package
- Switching-loss rating includes all "tail" losses
- HEXFRED™ soft ultrafast diodes
- Optimized for high operating frequency (over 5kHz)

Product Summary

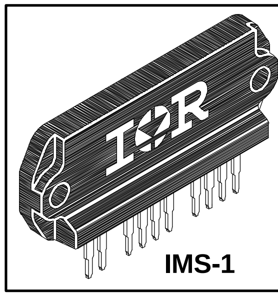
Output Current in a Typical 20 kHz Motor Drive

10 A_{RMS} with T_C = 90°C, T_J = 125°C, Supply Voltage 360Vdc, Power Factor 0.8, Modulation Depth 80%.

Description

The IGBT technology is the key to International Rectifier's advanced line of IMS (Insulated Metal Substrate) Power Modules. These modules are more efficient than comparable bipolar transistor modules, while at the same time having the simpler gate-drive requirements of the familiar power MOSFET. This superior technology has now been coupled to a state of the art materials system that maximizes power throughput with low thermal resistance. This package is highly suited to power applications and where space is at a premium.

These new short circuit rated devices are especially suited for motor control and other totem-pole applications requiring short circuit withstand capability.



IMS-1

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current, each IGBT	33	A
I_C @ T_C = 100°C	Continuous Collector Current, each IGBT	17	
I_{CM}	Pulsed Collector Current ①	100	
I_{LM}	Clamped Inductive Load Current ②	100	
I_F @ T_C = 100°C	Diode Continuous Forward Current	15	
I_{FM}	Diode Maximum Forward Current	100	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
V_{ISOL}	Isolation Voltage, any terminal to case, 1 min.	2500	V_{RMS}
P_D @ T_C = 25°C	Maximum Power Dissipation, each IGBT	83	W
P_D @ T_C = 100°C	Maximum Power Dissipation, each IGBT	33	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	5-7 lbf•in (0.55 - 0.8 N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Junction-to-Case, each IGBT, one IGBT in conduction	—	1.5	°C/W
$R_{\theta JC}$ (DIODE)	Junction-to-Case, each diode, one diode in conduction	—	2.0	
$R_{\theta CS}$ (MODULE)	Case-to-Sink, flat, greased surface	0.1	—	
Wt	Weight of module	20 (0.7)	—	g (oz)

Revision 2

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage ③	600	—	—	V	V_{GE} = 0V, I_C = 250µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temp. Coeff. of Breakdown Voltage	—	0.60	—	V/°C	V_{GE} = 0V, I_C = 1.0mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.1	2.7	V	I_C = 30A	V_{GE} = 15V
		—	2.6	—		I_C = 52A	
		—	2.3	—		I_C = 30A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	5.5		$V_{CE} = V_{GE}$, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temp. Coeff. of Threshold Voltage	—	-14	—	mV/°C	$V_{CE} = V_{GE}$, I_C = 250µA	
g_{fe}	Forward Transconductance ④	9.8	17	—	S	V_{CE} = 100V, I_C = 30A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	—	6500		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	—	1.3	1.7	V	I_C = 25A	
		—	1.2	1.5		I_C = 25A, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±500	nA	V_{GE} = ±20V	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
Q_g	Total Gate Charge (turn-on)	—	120	200	nC	I_C = 30A	
Q_{ge}	Gate - Emitter Charge (turn-on)	—	27	42		V_{CC} = 400V	
Q_{gc}	Gate - Collector Charge (turn-on)	—	44	73			
$t_{d(on)}$	Turn-On Delay Time	—	74	—	ns	T_J = 25°C	
t_r	Rise Time	—	100	—		I_C = 30A, V_{CC} = 480V	
$t_{d(off)}$	Turn-Off Delay Time	—	260	460		V_{GE} = 15V, R_G = 5.0Ω	
t_f	Fall Time	—	190	290		Energy losses include "tail" and	
E_{on}	Turn-On Switching Loss	—	1.9	—	mJ	diode reverse recovery.	
E_{off}	Turn-Off Switching Loss	—	2.6	—			
E_{ts}	Total Switching Loss	—	4.5	7.0			
t_{sc}	Short Circuit Withstand Time	10	—	—	µs	V_{CC} = 360V, T_J = 125°C	
						V_{GE} = 15V, R_G = 5.0Ω, V_{CPK} < 500V	
$t_{d(on)}$	Turn-On Delay Time	—	77	—	ns	T_J = 150°C,	
t_r	Rise Time	—	100	—		I_C = 30A, V_{CC} = 480V	
$t_{d(off)}$	Turn-Off Delay Time	—	530	—		V_{GE} = 15V, R_G = 5.0Ω	
t_f	Fall Time	—	360	—		Energy losses include "tail" and	
E_{ts}	Total Switching Loss	—	7.3	—	mJ	diode reverse recovery.	
C_{ies}	Input Capacitance	—	2900	—	pF	V_{GE} = 0V	
C_{oes}	Output Capacitance	—	220	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	30	—		f = 1.0MHz	
t_{rr}	Diode Reverse Recovery Time	—	50	75	ns	T_J = 25°C	
		—	105	160		T_J = 125°C	I_F = 25A
I_{rr}	Diode Peak Reverse Recovery Current	—	4.5	10	A	T_J = 25°C	
		—	8.0	15		T_J = 125°C	V_R = 200V
Q_{rr}	Diode Reverse Recovery Charge	—	112	375	nC	T_J = 25°C	
		—	420	1200		T_J = 125°C	di/dt = 200A/µs
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery During t_b	—	250	—	A/µs	T_J = 25°C	
		—	160	—		T_J = 125°C	

Notes: ① Repetitive rating; V_{GE}=20V, pulse width limited by max. junction temperature.
② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10µH, R_G= 5.0Ω.
③ Pulse width ≤ 80µs; duty factor ≤ 0.1%.
④ Pulse width 5.0µs, single shot.

Refer to Section D - page D-13 for Package Outline 4 - IMS-1 Package (10 pins)